OPERATING INSTRUCTIONS

TYPE 1535-B

CONTACTOR

CARNEL LABS CORPORATION

GENERAL RADIO COMPANY

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OPERATING INSTRUCTIONS

TYPE 1535-B

CONTACTOR

Form 1535-0100-D
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GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

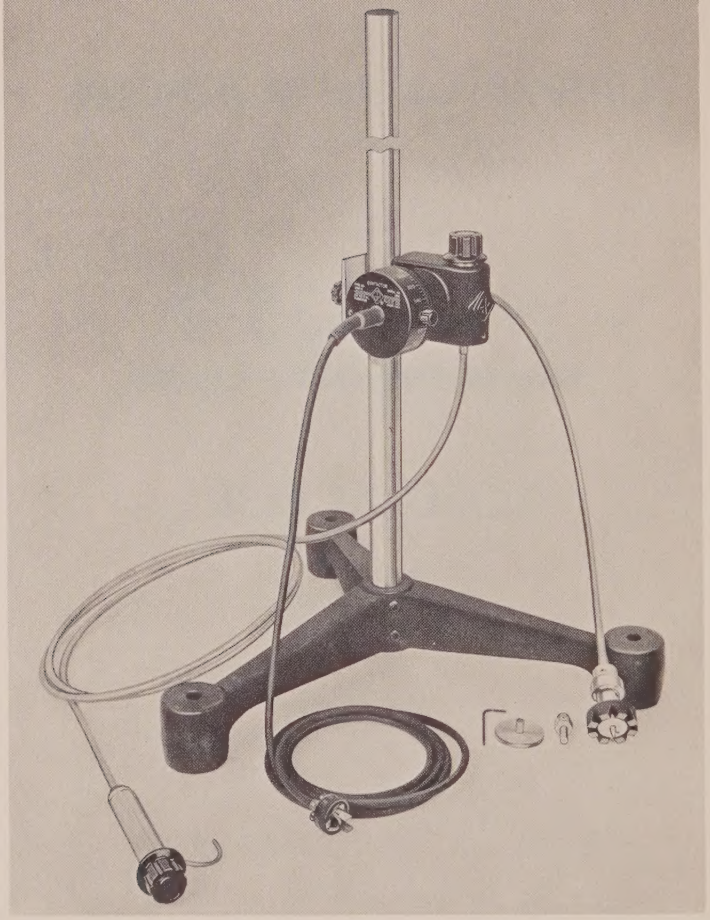

Figure 1. Type 1535-B Contactor.

SPECIFICATIONS

SPEED RANGE:	0 to 1000 rpm.
CONTACTS PER REVOLUTION:	One.
RANGE OF PHASE ADJUSTMENT:	360°.
RANGE OF HEIGHT ADJUSTMENT:	6 inches to 4 feet.
DIAMETER OF BASE:	18 inches.
ACCESSORIES SUPPLIED:	Auxiliary coupling devices for connection to shaft in which hole has been drilled; separate connector plug for older Type 1532 Strobolume; hex wrench.
NET WEIGHT:	19¾ pounds.

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TYPE 1535-B CONTACTOR

Section 1
INTRODUCTION

1.1 PURPOSE. The Type 1535-B Contactor (Figure 1) is a control and coupling device for synchronizing a stroboscope with a rotary shaft so that motion can be observed as a function of shaft angle. It is especially useful in the examination of relatively low - speed machinery, with the Type 1532-D Strobolume, in such applications as the timing of loom shuttles and the adjustment of register in printing. It can be used equally well with the Strobotac® electronic stroboscope or with the combination of Strobotac and Strobolux, at speeds up to 1000 rpm. For higher speeds the Type 1536-A Photoelectric Pickoff should be used.

1.2 DESCRIPTION. The contactor consists of a set of breaker points and a cam to open the contacts. The construction is similar to that used in automobile distributors except that the cam has only one flat instead of six or eight. The angular position (phasing) of the contacts with respect to the rotating shaft is adjustable over 360 degrees. The relative position of the contact is indicated on a scale calibrated in five-degree intervals. The scale may be set to any arbitrary zero setting. The angle of rotation of the contacts from the zero point is read directly in degrees, eliminating the need for any mental addition or subtraction.

Two angular-position controls are available for phasing. One is at the end of the 10-foot shaft, and the other is mounted on the contactor body. The contactor assembly is mounted on a 4-foot rod secured in a heavy cast-iron base 18 inches in diameter. The height can be adjusted from 6 inches to 4 feet.

To attach the rotor to the machine under inspection, use either the magnetic clutch or an auxiliary coupling device. Auxiliary couplings supplied are: Type 1535-P2 Adaptor Disc for small or nonmagnetic shafts; Type 1535-P3 Plug and Type 1535-P4 Coupling Adaptor for permanent installations. (See Figure 2.) Use of these couplings is discussed in paragraphs 2.1.2 and 2.1.3.

Section 2
OPERATING PROCEDURE

2.1 CONNECTIONS

2.1.1 CONNECTION OF MAGNETIC CLUTCH. The magnetic clutch head can be attached to or removed from a shaft while the shaft is in motion. Hold the head until the center pin is fitted into the shaft center, then push the magnet into contact with the shaft. To remove the magnet from a moving shaft, grasp the nonrotating collar just behind the magnet assembly and pull the magnet quickly away from the shaft. If the shaft has not been center-drilled but is reasonably flat, the magnet may work satisfactorily, provided that all grease is cleaned off the shaft end. Centering the magnet will be more difficult, but should not present a great problem. Occasionally it may help to remove the center pin when the magnet is used on a shaft that has not been drilled. (Refer to paragraph 3.2.2.)

2.1.2 CONNECTION OF TYPE 1535-P2 ADAPTOR DISC. The Type 1535-P2 Adaptor Disc (Figure 2) is supplied for coupling to small or non-magnetic shafts. Drill a hole, 1/4 inch in diameter and 3/8 inch deep, into the end of the shaft, and drive the adaptor disc into this hole. Then attach the magnet to this disc as described in paragraph 2.1.1.

2.1.3 CONNECTION OF TYPE 1535-P4 COUPLING ADAPTOR. For more permanent installations, the Type 1535-P3 Plug can be pressed into a hole 1/4 inch in diameter and 1/2 inch deep, and the Type 1535-P4

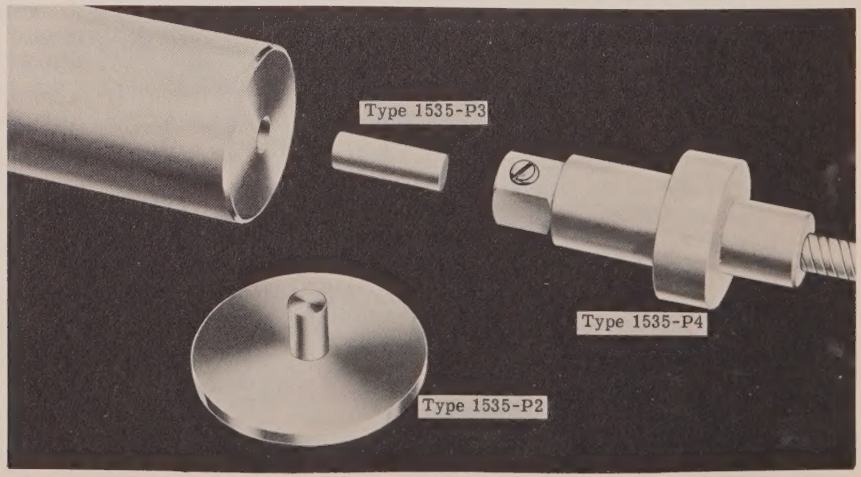

Figure 2. Close-Up of Alternative Coupling Devices.

Coupling Adaptor attached to it. The coupling adaptor is interchangeable with the magnet, which can be unscrewed from the end of the flexible shaft after the setscrew on the face of the centering disc is loosened. (Refer to paragraph 3.2.2.)

The flexible shaft running from the magnet to the contactor assembly may be straight or bent at angles up to 90 degrees. Adjust the contactor assembly to about the same height as the driving shaft, avoiding short bends and kinks in the flexible shaft. Improper alignment may loosen the magnet. When properly adjusted, the flexible shaft will run free without vibration. If the magnet slips, due to excessive machine vibration or a rough shaft end, a direct connection must be used.

2.2 CONTROL OF STROBOSCOPE. When the Type 1532-D Strobolume is to be controlled, insert the plug at the end of the contactor cable into the receptacle on the rear of the Strobolume. Set the INTENSITY switch on the Strobolume to the desired position and turn the power on. The HIGH INTENSITY position will allow maximum brilliance for limited periods of time up to about 1200 rpm. The LOW INTENSITY position may be used continuously. Further details are given in the operating instructions for the Type 1532-D Strobolume.

When a Type 1531-A Strobotac is to be controlled by the contactor, the plug at the end of the contactor cable is inserted into the INPUT jack on the panel of the stroboscope. Refer to the operating instructions for the Type 1531-A for information on setting the range switch.

To increase contact life, unplug the contactor from the stroboscope when observations are not being made.

2.3 PHASING. The angular position of the contacts with respect to the rotating shaft may be changed by means of the control knob on the contactor assembly or by the knob at the end of the 10-foot remote-phasing-control cable. A dial, calibrated in five-degree intervals, indicates the relative position of the contacts. The dial can be set to zero at any of the index lines on the contactor, after the thumb screw at the zero mark is loosened. Be sure to retighten the thumb screw before rotating the phasing control knob; otherwise the dial will slip and the zero-degree setting will be in error. The dial is very useful in checking the timing of looms or other machines where a certain action takes place at a specified number of degrees of shaft rotation.

On a machine with considerable vibration, the magnet may creep, and thus the image being observed will not be steady. To check magnet creeping, rotate the phasing control to its original setting, and determine if the reference point has changed or draw a pencil line across magnet

and shaft and notice whether the lines are offset after a few minutes of operation. If the magnet is slipping and the slipping cannot be eliminated by cleaning of the shaft end, it will be necessary to use a permanent coupling as described in paragraph 2.4.

End play is present in the remote-phasing cable to eliminate any binding as the position of the cable is changed. The phasing sleeve may be rotated several turns in either direction.

2.4 INSTRUCTIONS FOR PERMANENT MOUNTING. Where permanent mounting is desired, remove the entire contactor assembly from the stand, take off the clamp plate, and use the two 1/4-28 tapped holes in the casting for mounting. The assembly can also be clamped to any rod 3/4 to 1-3/8 inches in diameter. The remote-phasing cable may be removed if it is not required. (Refer to paragraph 3.2.4.)

Section 3
SERVICE AND MAINTENANCE

3.1 WARRANTY AND SERVICE. We warrant that each new instrument sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel will be repaired, or, at our option, replaced without charge.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or telephone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

3.2 DISASSEMBLY PROCEDURES.

3.2.1 GENERAL. All major parts of the contactor are accurately machined to fit. Therefore, do not force parts when assembling or disassembling the contactor. The letters and numbers in parentheses in the following paragraphs refer to Figures 3 and 4, pages 6 and 7.

3.2.2 REMOVAL OF MAGNET. To remove the magnet (B) from the end of the rotating sleeve, proceed as follows:

a. Loosen the setscrew (A1) on the face of the magnet centering disc (A), and turn the magnet counterclockwise.

b. Unscrew and remove the magnet from the sleeve. Accessory fittings now may be screwed into the sleeve.

c. If it is desired to remove the center pin (C), withdraw spring (D) and pin from the magnet.

d. After screwing the magnet back on the sleeve, be sure to tighten the setscrew (A1); if this screw is loose, the magnet may come off when rotated counterclockwise.

3.2.3 REMOVAL OF MAGNET ASSEMBLY. To remove the entire magnet assembly from the flexible cable (F), proceed as follows:

a. Loosen setscrews (E1 and E2) on the rotating sleeve. It is not necessary to loosen the setscrew on the face of the magnet centering disc.

b. When replacing the magnet assembly, be careful not to overtighten the screw (E2) on the sleeve, as it will collapse the flexible shaft casing.

3.2.4 REMOVAL OF FLEXIBLE PHASING CABLE. Occasionally the 10-foot phasing control cable (J) is not needed. To remove it, proceed as follows:

a. Free the setscrew (G1) located directly above the cable on the contactor casting (G).

b. Loosen the DEEP setscrew on the phasing knob (M) located at the contactor casting. Do not loosen the setscrew near the surface of the knob.

c. Remove the flexible cable.

To replace the phasing cable, reverse the above procedure, pushing the phasing knob (K) all the way in. Maintain a constant pressure on the phasing knob while tightening the screw (G1). Be careful not to overtighten the screw. Insert the casing about 3/8 inch.

3.2.5 REMOVAL OF THE CONTACT ASSEMBLY. To remove the contact assembly (S) for adjustment, inspection, or replacement, proceed as follows:

a. Loosen the setscrew (U1) on the face of the dial. It is not necessary to remove this screw.

b. Loosen by about three turns the setscrew (U2) located at the 180-degree point on the dial.

c. Remove the thumbscrew (U3) at the zero point.

d. Remove the calibrated dial (U), exposing the contact assembly.

e. Remove the screw (S1) on the breaker arm, freeing the unit. Do not touch the screw on the phosphor bronze contact strip.

The gap is factory-adjusted to 0.024 inch. If the contact assembly is badly pitted, it should be replaced.

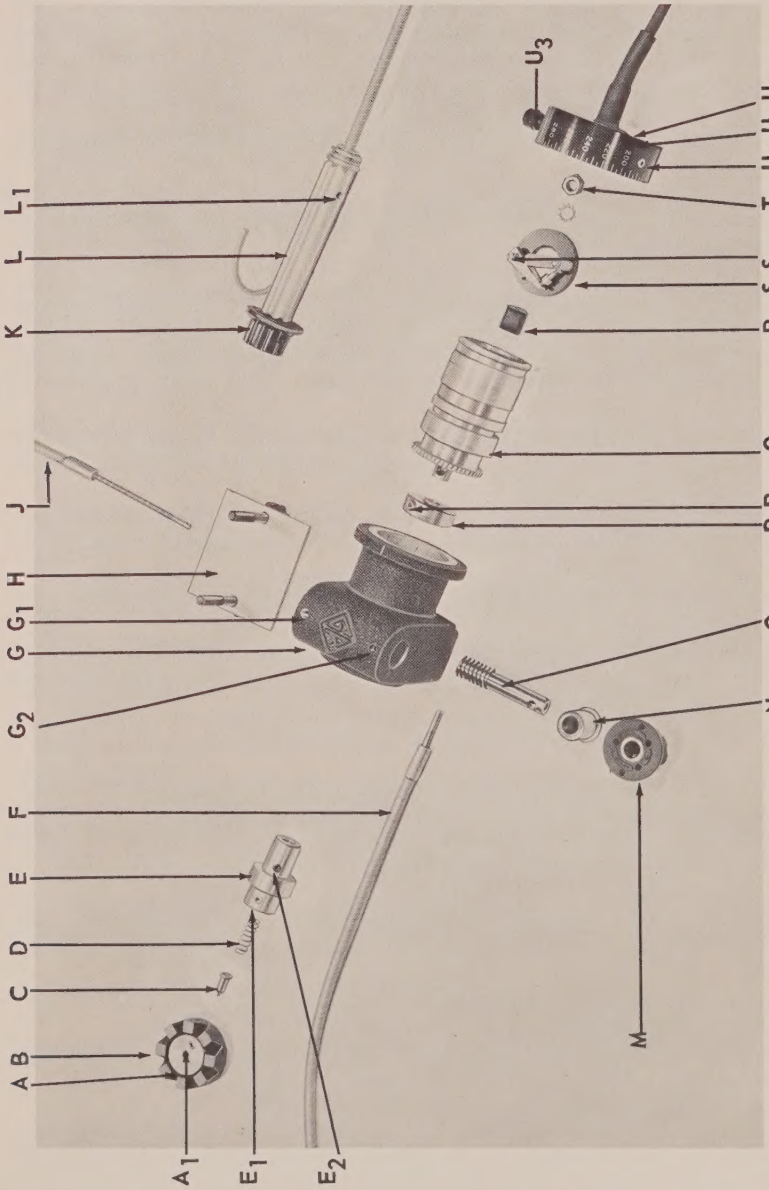

Figure 3. Exploded View of Contactor.

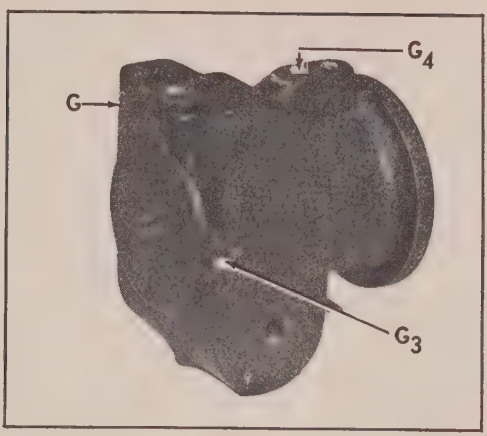

Figure 4. Contactor Casting.

LEGEND FOR FIGURES 3 AND 4.

A Centering disc
A_1 Setscrew
B Magnet
C Center pin
D Spring
E Rotating sleeve
E_1 Setscrew
E_2 Setscrew
F Flexible cable, 18-inch
G Contactor casting
G_1 Screw
G_2 Setscrew
G_3 Setscrew
G_4 Setscre
H Mounting plate, screws, rod, base
J Flexible cable, 10-foot
K Knob, bushing
L Handle
L_1 Screw
M Knob
N Bushing
O Worm
P Flywheel
P_1 Setscrew
Q Barrel
R Fiber cam, shaft
S Contact assembly
S_1 Screw
T Nut
U Dial
U_1 Setscrew
U_2 Setscrew
U_3 Thumbscrew

To remove the fiber cam (R), proceed as above, and then remove the locking nut (T) at the end of the shaft and pull the cam out.

3.3 MAJOR REPAIRS.

NOTE

Service information contained in paragraphs 3.3.1 through 3.3.4 should be attempted only by skilled personnel and if it is impractical to return the contactor to the factory for repairs.

3.3.1 REPLACEMENT OF THE 18-INCH FLEXIBLE CABLE. Replacement of the 18-inch flexible cable requires dismantling of the contactor and should not be undertaken by unskilled persons. The procedure is as follows:

a. Remove the magnet assembly as described in paragraph 3.2.3.

b. Remove the setscrew (G4) at the base of the contactor casting (G). This screw is next to the 1/4-28 thumb screw used to clamp the contactor to the stand.

c. Below setscrew G4 is another setscrew used to align the barrel (Q) in the casting. This second screw (with dog point) should never be set up tight, as it will lock the barrel; it should be backed off 3/4 of a turn after it hits the barrel. After the screws (G4) have been removed, the barrel may be pulled out, along with the 18-inch flexible cable.

d. To remove the 18-inch cable from the barrel, loosen the setscrew (P1) on the flywheel (P). The outer casing may be removed as described in paragraph 3.4.2. When replacing the cable, insert it exactly 1/2 inch into the hole in the flywheel. When replacing the casing, be sure not to insert it farther than the original factory adjustment.

e. When reassembling, hold the flywheel tightly against the bearing to eliminate end-play. Tighten the setscrew (P1) while holding the thumb against the cable and two fingers against the end of the flywheel. This procedure insures that there will not be any play between the flywheel and bearing.

f. When reinserting the barrel (Q), be sure that you do not damage the threads by forcing them against the worm gear (O). The slot in the center of the barrel should be centered in the setscrew hole (G4) in the casting. As a double check, the barrel should extend 9/16 inch from the end of the casting. Insert the dog-pointed screw (G4) and carefully run it down until it bears against the barrel. Be sure that the screw does not hit the edge of the groove and nick it. After the screw bottoms, back it off 3/4 of a turn. Now insert the check screw and run it up tight against the lower screw.

3.3.2 REMOVAL OF WORM DRIVE. To remove the worm drive assembly (M,N,O) used in the phasing control, proceed as follows:

a. Remove the barrel as described in paragraph 3.3.1, and the flexible phasing cable as described in paragraph 3.2.4.

b. Free the setscrew (G2) located near the phasing knob on the casting. The assembly is free and may be pulled out.

c. To remove the bushing (N) from the worm, loosen both screws on the knob (M). Before assembling, oil thoroughly with light machine oil. When assembling, be sure there is no play between the bushing and the knob, but do not permit the bushing to bind, either. Before tightening the knob, be sure that one setscrew is clear to go through the hole in the worm shaft. The bushing is eccentric, and, after the assembly is replaced, it should be rotated to obtain minimum backlash before the setscrew (G2) is tightened. Once again, be careful not to overtighten, or else the shaft may bind.

3.3.3 DISASSEMBLY OF 10-FOOT CABLE. Remove the cable (J) from the contactor body as described in paragraph 3.2.4. To remove the inner cable from the outer sheath, hold the sheath in one hand and pull on the knob (K). To take off the knob and bushing, loosen the DEEP setscrew on the knob.

If it should ever be necessary to remove the handle assembly (L) from the phasing cable (J), proceed as outlined in the previous paragraph. Then free the screw (L1) and remove the handle. When replacing the handle, be careful not to overtighten the setscrew (L1), or it will pinch the cable.

3.3.4 TWIST-LOCK ELECTRICAL PLUG. To replace the twist-lock plug, proceed as if you were wiring a standard household electrical plug. But be certain that the WHITE lead is connected to the WHITE plated blade on the plug and the BLACK lead to the UNPLATED blade.

3.4 MAINTENANCE.

3.4.1 SPEED RANGES. The magnet drive shaft and contactor are mounted in ball bearings and should run for long periods without attention or lubrication. The contactor may be run continuously up to about 1000 rpm.

3.4.2 FLEXIBLE SHAFTS. Both flexible shafts are greased inside, and, except when continuously operated for a year or more, should not require further lubrication. At very high speeds, some lubricant may work out through the casing of the 18-inch flexible shaft but need not be replaced except during routine inspections.

If the 18-inch shaft requires lubrication, remove the magnet assembly as described in paragraph 3.2.3, loosen setscrew G3 on the contactor casting (G), and remove the casing, exposing the flexible shaft. Lubricate with grease of the type used for an automobile speedometer cable (Lubrico Grease, Grade MD, Master Lubricant Co., Philadelphia, Pa.).

3.4.3 BEARINGS. The main operating bearings are ball bearings, which are lubricated for life and thus require no attention. The bearings in the

phasing control shaft also require no attention since they are used at slow speeds and are factory adjusted.

3.4.4 CONTACTS. When operated at low speeds, such as encountered in looms and printing presses, the silver alloy contacts should not need attention for some time. If desired, the contact assembly may be removed and replaced (refer to paragraph 3.2.5), eliminating the need for cleaning the contacts.

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